**Special exercise 1: essay (50 points)**

Here, the task is to write an essay about machine learning (ML).

Again, suggested length is 2-3 pages.

In this shared folder you will find several review papers:

<https://drive.google.com/drive/folders/1R8y2_4kBj_6bvg4NEnzMoLbClS3Zb-EP?usp=sharing>

Of these, Kapoor et al. is about machine learning challenges in general, the others are about specific methods and/or applications in neuroscience /neuroimaging.

If you choose to review the Kapoor paper, your instructions are:

* Describe what “leakage” is in ML, why it is a problem, how it can be avoided/minimized
* What are other issues in ML mentioned in this paper and how can they be dealt with?
* You can ignore the case study if you like

For the other papers, the instructions are:

* Summarize the principles behind the ML method(s) discussed in this paper
* You don’t have to go into mathematical details (unless you really want to)
* What are advantages and challenges of the method(s)?
* If there are more general challenges of using ML mentioned in the paper, you can briefly summarize them
* Of the clinical applications mentioned in the paper, describe several that you find interesting
* Which results have already led to clinical applications or shown promise that they might soon be?

Keep in mind that ML is a relatively new, dynamic field and its methods and terminology are constantly evolving. Specifically, as we discussed in the lectures, the term “validation set” is sometimes used instead of “test set”. As far as I see (and correct me if you think I am wrong), all these papers here mean “test set” in the sense that we discussed in the lectures.

Should you feel that it makes sense, you can also write an essay about several of these papers.

If you know of another paper about ML that you would like to write an essay about (that either discusses ML in neuroscience/-imaging or discusses a very fundamental ML issue that you think is relevant for neuroscience), please message me about this.

Citing the main references for the most important methods / findings is strongly encouraged.